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STANDARD FREQUENCY RADIO EMISSIONS

The Bureau hereby announces changes in its schedule of standard frequency radio emissions from its station WWV, Beltsville, Md., near Washington, D. C. The changes will substantially increase the service available to transmitting stations for adjusting their transmitters to exact frequency, and to the public for calibrating frequency standards and transmitting and receiving apparatus.

The emissions will be on 2 days a week instead of 1 day as formerly, and will be on the 3 frequencies, 5,000, 10,000, and 15,000 kilocycles per second, instead of the single frequency 5,000. The changes are the result of experimental emissions made by the Bureau on 10,000 and 15,000 kc, with the aid of a large number of organizations and persons who observed the received signals at various places. These tests showed that service could be rendered at all distances in the daytime by the use of the three frequencies. With the use of 5,000 kc alone, it was necessary to have emissions at night in order to give service at distances greater than a few hundred miles from Washington. With the use of the three frequencies no night emissions will be necessary.

Of the emissions now scheduled, those on 5,000 kc are particularly useful at distances within a few hundred miles from Washington, those on 10,000 kc are useful for the rest of the United States, and those on 15,000 kc are useful in the United States and other parts of the world as well.

Beginning February 1, 1935, and continuing each Tuesday and Friday thereafter (except legal holidays) until further notice, 3 frequencies will be transmitted as follows: Noon to 1 p.m., Eastern standard time, 15,000 kc; 1:15 to 2:15 p.m., 10,000 kc; 2.30 to 3:30 p.m., 5,000 kc.

The emissions consist mainly of continuous, unkeyed carrier frequency, giving a continuous whistle in the phones when received with an oscillating receiving set. For the first 5 minutes the general call (CQ de WWV) and the announcement of the frequency are transmitted. The frequency and the call letters of the station (WWV) are given every 10 minutes thereafter.

The accuracy of the frequencies transmitted is at all times better than

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a part in 5 million. From any of them, using the method of harmonics, any frequency may be checked. Information on how to receive and utilize the signals is given in a pamphlet obtainable on request addressed to the National Bureau of Standards, Washington, D. C.

The Bureau desires to receive reports on reception of these emissions, especially because radio transmission phenomena change with the season of the year. The data desired are approximate field intensity, fading characteristics, which of the 3 frequencies is received best, and the suitability of the signals for frequency measurements. It is suggested that in reporting on intensities, the following designations be used where field intensity measurement apparatus is not used: (1) hardly perceptible, unreadable; (2) weak, readable now and then; (3) fairly good, readable with difficulty; (4) good, readable; (5) very good, perfectly readable. Statements are desired as to intensity of atmospherics and as to whether fading is present or not, and if so, its characteristics, such as time between peaks of signal intensity. Correspondence should be addressed, National Bureau of Standards, Washington, D. C.

INFRARED RADIATION FROM AN OTTO CYCLE ENGINE

In Technical News Bulletin 191 (March 1933) mention was made of a paper, subsequently published in Industrial & Engineering Chemistry, describing early work on the measurement of infrared radiation from explosions in an engine cylinder. Two further papers will appear shortly in the same journal, designated parts II and III of the series.

Part II describes the improved apparatus used in making measurements of radiant energy, to a wave length of 11μ, emitted by explosions in the cylinder of a small L-head engine. Observations, made through 5 selective filters, are recorded for: Normal and knocking engine flames; blast-torch flames of liquid fuels; blowpipe flames of hydrogen, carbon monoxide, and city gas; a highly luminous acetylene flame; the flame of gasoline burning on a wick; and a small blackbody furnace heated to temperatures between 800° and 1,400° K.

In Part III the data recorded in part II are analyzed mathematically to obtain approximate spectral energy distributions for the several flames. The method used consists in setting up a conventionalized spectrum, composed of appropriate geometrical shapes properly located on a wavelength scale, to simulate the spectral energy distribution for a flame in which the prominent radiating substances are incandescent carbon particles, carbon dioxide, and water vapor. Calculations are then made to determine the relative amounts of energy which must actually be emitted in the several regions of the conventionalized spectrum to produce the observed filter readings. This method should be particularly useful whenever it is difficult or impossible to employ the spectrographic method in infrared work, provided only that the location and shapes of all prominent emission bands are known for all substances likely to be radiating, and that the number of these bands does not exceed the number of appropriate filters available.

For the present investigation this analysis indicates that insignificant amounts of energy (relative to the total measured) are radiated by incandescent carbon particles in the engine cylinder, even with rich mixtures giving bright yellow-red flames. For all complex flames observed substantial amounts of energy are shown in the regions characteristic of carbon dioxide and water vapor.

"Total radiation" curves for normal and knocking runs yield new and contrasting information on the reaction time for a given element of charge, and on the depth of reaction zone behind the visible flame front. Thus, in a normal explosion, infrared radiation increases in the neighborhood of the spark plug until the flame arrives under a window at the opposite end of the combustion chamber, 10 cm away. This represents the period of time required for 20° of engine crank rotation, indicating a greater reaction zone depth and a longer reaction time than has hitherto been accepted. In a knocking explosion the reaction in a given element of charge within the knocking zone is completed much more rapidly after inflammation, while the inflammation of a given element within this zone also occurs earlier than in a normal explosion.

It will therefore be seen that measurements of total radiation from explosions in an engine cylinder can be conveniently utilized to yield information on reaction zone depth, and duration of combustion in a given element of charge; while it is possible that a mathematical analysis specially appropriate for nonluminous flames

(i. e., taking no account of radiation from incandescent carbon particles) would assist in interpreting spectral energy distribution differences between the several flames.

MANUAL OF FIRE-LOSS PREVENTION

Handbook H19, Manual of Fire-loss Prevention of the Federal Fire Council, presents in concise form the principles on which fire-resistance classifications of building types and building materials are based, general methods for controlling the spread of fire by structural provisions and application of appropriate types of fire-extinguishing equipment, and general fire-prevention measures that can be introduced in the management routine for services and properties.

A basis is outlined for estimating the justifiable expense that can be incurred for fire-loss prevention, considering the value of the property concerned and the inherent fire hazards presented. Under most conditions, the annual expense need not exceed the reduction in the yearly fire loss that can be effected. By judicious selection and application of measures best adopted for given conditions, the resulting reduction in the fire loss, taken as an average over a period of years, may be greater than the expense incurred for fire-loss prevention.

The general means for preventing the origin of fires and decreasing their destructiveness, include considerations relating to building construction and service and fire-protection equipment; safeguarding of hazards incurred in providing heat, power, light, and ventilation; and those associated with the occupancy. The latter may range from risks encountered in office buildings to very hazardous processing and storage.

General maintenance requirements that can be applied in preventing fire loss include: the avoidance of accumulations of combustible waste materials, the maintenance of buildings and their equipment in good repair, the requirement of regular inspections for fire hazard, and the establishment of the best form of organization for combating fires under the given conditions. Suggestions relative to different types of organization for fire-loss prevention are given, supplemented by outlines for inspection reports, 3 types of self-inspection forms, and a fire report form.

The manual was prepared under the auspices of the Federal Fire Council which was organized to serve as a medium of contact between Federal Government departments and establishments on matters pertaining to fire prevention and protection. By means of committee activities, including inspections of typical properties and occupancies, meetings of the main group, and dissemination of reports and other informative material, the council is endeavoring to maintain a continuing interest in all subjects that will result in materially decreasing the loss from fire.

Copies of this Handbook can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 20¢ each.

STABILITY OF FILMS USED FOR REPRODUCTION OF RECORDS

An additional fund of $5,000 allotted to the National Research Council for the purpose, has made possible the resumption of research at the Bureau on preservation of records. One problem being considered for study is the stability of motion-picture films used for the reproduction of records, to find if the film copies of written and printed matter are likely to be permanent.

The mechanism for the production of film-slide copies of printed and written material and the reproduction of the copies for reading, has reached a satisfactory stage of commercial development, and without doubt this method of reproducing record material is destined to assume great importance because of its low cost, the conservation of library space, and the convenience in handling records in this form. Librarians are also interested in having motion-picture records of important events available for storage in libraries, and it is to be expected that satisfactory arrangements to this end could be effected with the producers of news reels.

Additional funds would be required for a thorough investigation of this kind and it is possible that they may be made available by industrial organizations concerned. The Bureau will be glad to give further details of the project to anyone interested.

MAINTENANCE, CALIBRATION, AND USE OF PAPER-TESTING INSTRUMENTS

A paper by F. T. Carson of this Bureau in the December number of Paper Industry is a popular discussion of the chief points in the maintenance, calibration, and operation of common paper-testing instruments. It calls attention to the development of paper-testing instruments from simple empirical tests depending almost wholly upon the judgment of an individual toward mechanical testing aids

that tend to minimize the personal element. A great many testing devices of varying degrees of merit have been designed to aid the paper technician, but many of them have had only a brief day and have then passed on. The choice of effective testing aids from among a confusion of unappraised devices is a very real problem to the paper technician. Although the Technical Association of the Pulp and Paper Industry has done what it can to simplify this problem, its present facilities do not permit of a systematic and thorough appraisal of the many and varied testing instruments that are being offered. It has, however, standardized a few important tests and apparatus, and this paper confines itself to the more important of these. It takes up first the approved means of measuring and recording the humidity and temperature in the testing room, and attempts to point out how easily one may be misled about the testing conditions unless these instruments are accorded the proper care and attention, and unless they are used intelligently. There follows then a brief discussion of common paper-testing instruments, such as the ream-weight balance, the dial micrometer for measuring thickness, the tensile-strength tester, the bursting-strength tester, the tearing tester, and the folding-endurance tester. Brief directions are given for calibrating these instruments, and some precautions are mentioned in connection with their care and operation. Emphasis is given to those phases of maintenance and calibration that can readily be attended to in any paper-testing laboratory, especially those of importance most likely to be neglected.

FACTORS AFFECTING HOSIERY PERFORMANCE

Research Paper RP753, in the January number of the Journal of Research, gives the results which have been obtained on the hosiery-testing machine since the publication of Research Paper RP679 (May 1934). It is shown that laundering, dyeing, aging, finishing, and construction all have a great effect on the distensibility, elasticity, and durability of the stockings on repeated distention. The information given furnishes a necessary background for the use of the machine for hosiery testing and demonstrates its suitability for researches in knitting, degumming, dyeing, finishing, aging, laundering, redyeing, and refinishing of hosiery.

A MAXWELL TRIANGLE YIELDING UNIFORM CHROMATICITY SCALES

In the practical comparison and specification of colors a knowledge of the magnitude of the least perceptible difference in color is of much importance. It is especially important in the setting of limits of tolerance and in deciding whether specifications have been satisfactorily met. In the January number of the Journal of Research (RP756) there is described a colorimetric coordinate system whose Maxwell triangle has the useful property that the length of any line on it is a close measure of the chromaticity difference between the stimuli represented at the extremes of the line. Such accurate chromaticity scales may be derived from this triangle merely by stepping off equal intervals on it that it has been called the "uniform-chromaticity-scale" triangle. The relation of the new system to previous colorimetric coordinate systems is given, together with a comparison of experimental sensibility data with corresponding data derived from the triangle. This comparison shows to what degree the triangle possesses the property intended for it. An important application of this coordinate system is its use in finding from any series of colors the one most resembling a neighboring color of the same brilliance—for example, the finding of the nearest color temperature for a neighboring non-Planckian color. The method is to draw the shortest line from the point representing the non-Planckian color to the Planckian locus.

USE OF PIPETTE METHOD IN FINENESS TEST OF MOLDING SAND

The fineness, or size distribution of the constituent particles, of a molding sand is one of its most important properties. No great difficulty is encountered in sizing relatively large particles by the use of sieves; however, in particles finer than 50 microns in diameter, other methods must be employed. Recent work at the Bureau (described in RP757 in the Journal of Research for January) has shown that the pipette method, a variation of the sedimentation type of method, is readily applicable to determining the fineness of the finer portion of molding sands. A transfer pipette is used to obtain samples of a water suspension of the

molding sand, which has been allowed to settle for a definite time, depending upon the size separation desired. The samples are evaporated to dryness and weighed. These weights afford a basis for calculating, on a percentage basis, the size distribution of the portion of the original material which is too fine to be classified by sieve analysis. Results of a high degree of reproducibility are possible. The pipette method surpasses other available methods for the determination of the fineness of molding sands in ease of manipulation and scope of information obtained.

AIRCRAFT MATERIALS AT SUB-ZERO TEMPERATURES

It is well known that some of the mechanical properties of steels and other structural metallic materials vary greatly with the temperature at which they are determined. In this connection less attention has been paid to the effect of low than to that of high temperatures. In the case of aircraft, subzero temperatures normally prevail, and more study of the properties of materials at these temperatures would seem to be in order. Work of this character is now in progress at the Bureau, plain carbon steels being the phase now under investigation. The tensile, hardness, and impact properties of a given carbon steel in heat-treated, normalized, and cold-drawn conditions are being compared at temperatures from +20° C (68° F) down to —80° C (—112° F). Particular attention is being directed to the effects of inherent austenitic grain size on the low-temperature properties, as well as the effect on the properties at room temperature of the minimum temperature to which the steel has previously been cooled, and the length of time the steel has been maintained at that minimum temperature.

WELDING FOR THE FABRICATION OF SHIPS

The welding of structural steel for buildings has made great progress during the past few years. It is now a well-recognized method of fabrication which is permitted by the building codes in many cities.

Welding is also used considerably in the fabrication of steel ships but usually for portions such as ventilators, etc., the failure of which would not endanger the vessel. Probably one reason why welding has not been more extensively used for fabricating vessels is the conservative attitude of the insurance organizations.

The use of welding in fabricating naval vessels shows that the entire structure can be welded satisfactorily and that there are advantages in welding instead of riveting. For the same strength the welded vessel can be lighter, which in a merchant ship increases the cargo carrying capacity and the earning capacity. The longitudinal joints in the plating for the hull can be welded satisfactorily and the joints will be tight which often is not the case with riveted joints. This is especially important for vessels carrying oil or other liquids, such as "oil tankers."

It is believed that it is economically practicable to build merchant vessels at least 10 percent lighter than riveted vessels, but the ship must be so designed as to take advantage of the possibilities of welding. There would be no appreciable saving in weight if a vessel designed for riveting were welded.

There is no necessity for "stress-relieving" the welded joints in a ship by heat treatment and in all probability stress-relieving is impracticable for ships and many other structures.

Insofar as the hull of a vessel is concerned the joints should be either all riveted or all welded. There are serious disadvantages in fabricating the hull of a vessel by using welds for some joints and rivets for others, particularly where the two kinds of joint meet as they must in a ship.

The successful fabrication of ships by welding depends upon the design which must be prepared by engineers who, by training and experience are competent to design welded vessels. They must have adequate test data on joints of the kind to be used and made from suitable material similar to that from which the vessel is to be constructed. There must be adequate inspection to insure that the vessel, and particularly the welds, comply with the design requirements, and that the joints are welded in the prescribed sequence. The material must be tested to determine whether it complies with the requirements not only for strength and ductility but also for welding properties.

The welders must be qualified, that is, they must have demonstrated their ability to make welds which have the required properties before they are permitted to work on a vessel. They should be requalified at stated intervals.

Although at present there may be few shipbuilders in this country equipped to build welded ships satisfactorily, every encouragement should be offered to shipowners to build welded vessels. This country would benefit eventually in the reduction in first cost and at once in the reduced cost of repairs and maintenance and the greater cargo-carrying capacity, which would assist this country in maintaining a merchant marine under the highly competitive conditions existing on the high seas at present.

FATIGUE PROPERTIES OF STEEL WIRE

Surface imperfections may exert a damaging effect upon the fatigue properties of a structural member. Therefore, the fatigue limit determined on machined and polished specimens of a material is not a safe criterion of the fatigue limit of a structural member made of the same material. Two methods for the fatigue testing of wire, on which the original surface as produced by the manufacturer has been retained, were developed by the Bureau in connection with its studies of the fatigue properties of galvanized steel suspension-bridge wire.

One method utilizes a modfication of the well-known R. R. Moore rotating-beam fatigue-testing machine. The specimens are 4 to 6 feet in length. The weight of the specimen produces a maximum bending stress in the middle of the span, which overcomes the effect of localized clamping stresses at the ends, and fractures in the grips are avoided. The fatigue limits of a heat-treated and galvanized-steel bridge wire 0.192 inch diameter, a Swedish valve-spring wire 0.162 inch diameter, and a cold-rolled mild steel wire 0.187 inch diameter were 45, 60, and 82 percent, respectively, of the fatigue limits obtained on short (3 inch length) machined and polished specimens of the same wires with diameters reduced to 0.130 inch in the midsection.

With the use of a suitable gripping device, it was found possible to make fatigue tests in the Haigh alternating-stress testing machine on specimens of wire with the original surface unaltered in the test length. The limiting ranges of pulsating tensile stresses were determined at various mean stresses between 50,000 and 200,000 lb/in.^{2} on cold-drawn and galvanized, and heat-treated and galvanized, steel bridge wires, and on a high-strength steel wire electroplated with zinc. The results showed that the limiting ranges of pulsating tensile stresses were practically independent of the mean stress within the range investigated.

A more complete report on this investigation will be found in the January number of the Journal of Research (RP754).

EFFECT OF SUPERHEATING ON CAST-IRON TEST BARS

Incidental to a study of molding technique and method of casting, the so-called "arbitration" transverse test bars for cast iron, some interesting information on the effect of superheating was obtained. The composition of pig iron used was:

	%
Total carbon	3.79
Manganese	.73
Phosphorus	.12
Sulphur	.06
Silicon	1.32

All heats were cast at 1,380° C. (2,515° F.), approximately 150° C. above the liquidus temperature of the pig iron used. All of the 3 sizes of bars cast (0.75, 1.20, and 2.2 inches diameter) showed distinctly an increase in strength with an increase in the maximum temperature to which the molten metal was superheated prior to pouring. For example, the transverse strength of bars 1.20 inch in diameter cast from the metal superheated to 1,600° C. (2,910° F.) was 7.6 percent greater than that of bars cast from metal superheated to 1,500° C. (2,730° F.); similarly, superheating of the iron to 1,700° C. (3,090° F.) produced bars the transverse strength of which was 7.8 percent greater than that of bars cast from metal superheated to 1,600° C. (2,910° F.). It is very evident that for this type of iron, superheating up to at least 1,700° C. (3,090° F.) is beneficial.

SIMPLIFIED PRACTICE RECOMMENDATION FOR STEEL REINFORCING BARS, REAFFIRMED

Simplified Practice Recommendation R26–30, Steel Reinforcing Bars, has been reaffirmed, without change, by the standing committee of the industry. This simplification program reduced the number of cross-sectional areas of reinforcing bars from 32 to 11, and limits the equivalent cross-sectional areas of the bars to 2 decimal places. The recommendation was first promulgated in 1925, and was reaffirmed, without change, in 1926, 1927, and 1928. The original program was modified in 1930. Copies of the

recommendation may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

SIMPLIFIED PRACTICE RECOMMENDATION FOR IRON AND STEEL ROOFING REAFFIRMED

Simplified Practice Recommendation R78–28, Iron and Steel Roofing, has been reaffirmed, without change, by the standing committee of the industry. This simplification program, which was proposed and developed by the industry, establishes dimensions for widths, lengths, gages, and weights of corrugated, roll, V crimp, and pressed standing seam galvanized or painted roofing, and has been instrumental in reducing the number of items of iron and steel roofing from 292 to 179, or approximately 39 percent.

This recommendation was first promulgated in 1925, when it was a part of Simplified Practice Recommendation R28, Sheet Steel. In 1928 it was separated from R28 and made an individual recommendation to facilitate periodic review and revision. This program was reaffirmed, without change, in 1931 and 1933. Copies of the recommendation may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at five cents each.

PROPERTIES OF SOME AMERICAN KAOLINS AND A COMPARISON WITH ENGLISH CHINA CLAYS

An investigation of American kaolins was made to supplement a similar investigation of English china clays. It was desired to determine the differences between the American and the English clays which might affect the substitution of the former for the latter in whiteware bodies, and, if possible, to find the reasons for these differences. Various properties of nine American kaolins were determined. It was found that these clays could be divided conveniently into a group of primary clays and 2 groups of secondary clays. The chief cause of differences in properties of the English china clays and comparable American kaolins was found to be their differing equivalent mineral compositions. The properties affected most are refractoriness, strength, shrinkage, and porosity of heat-treated specimens, and thermal expansion of specimens heated to certain temperatures. These properties differ because of the smaller amount of fluxing constituents in the American clays as compared with the English clays. The foreign clays differ in color from most of the comparable domestic ones because of the greater titanium content of the latter. It was found that, by adding fluxes to American kaolins and kaolin blends, mixtures with properties closely simulating those of English china clays could be produced. It should be possible, with proper selection of domestic materials, to make a complete substitution for English china clays in whiteware bodies, with negligible attendant changes in the properties of the bodies.

GLASSES CONTAINING SODA, LIME, AND ALUMINA

If the 3-component glasses containing lime or alumina be regarded as soda-silica glasses in which a part of the silica is replaced by either lime or alumina, the effects of the replacements may be compared by using the properties of the soda-silica glass as a basis for comparison. In the following table certain data are given for an 80-percent silica-20-percent soda glass and also similar data for glasses in which 10 percent of the silica has been replaced by alumina, lime, or soda.

Kind of glass	Refractivity	Density	Coefficient of expansion to 400° C	Softening temperature	Coefficient of expansion to softening temperature
			μ/cm/°C	°C	μ/cm/°C
80% SiO_2	0.4890	2.380	0.107	527	0.116
20% Na_2O					
70% SiO_2	.4982	2.428	.103	575	.124
20% Na_2O					
10% Al_2O_3					
70% SiO_2	.5220	2.522	.117	570	.132
20% Na_2O					
10% CaO					
70% SiO_2	.5018	2.463	.144	493	.160
30% Na_2O					

It is evident that alumina produces the least change in refractivity and density, lime produces the greatest change, and soda is intermediate between lime and alumina in its effect.

Similarly, alumina produces the least change in coefficient of expansion, but soda produces the greatest change, while lime is intermediate. Lime and alumina produce about the same increase in softening temperature, while soda decreases the softening temperature.

The values given in the table above were not obtained from actual glasses but by interpolation of data derived in the Bureau's studies of the properties of the soda-lime-silica glasses and soda-alumina-silica glasses.

BUILDING AND MONUMENTAL GRANITES

A Bureau study of the granites of this country used for building and monumental purposes was started in 1932, and determinations of the more common physical properties have been completed on 75 samples. The samples represent the products of 13 States as follows: 12 from Maine, 7 from New Hampshire, 5 from Vermont, 9 from Massachusetts, 6 from Connecticut, 2 from New York, 1 from Pennsylvania, 6 from North Carolina, 3 from South Carolina, 4 from Georgia, 7 from Wisconsin, 10 from Minnesota, and 3 from Texas. Most of these were normal granites consisting mainly of feldspar, quartz, and mica, but a few were the so-called "black granites", which should probably be classed as diorites.

The determinations included compressive strength, both perpendicular and parallel to the rift of dry specimens and of specimens after soaking 14 days in water; water absorption for immersing periods of 2 and 14 days; bulk density; and porosity. The average compressive strength of the dry samples was 24,400 lb/in.^{2} perpendicular to the rift and practically the same parallel to the rift. Specimens tested in the wet condition averaged about 12 percent lower in strength than those tested dry. The highest strength value was 47,000 lb/in.^{2} obtained with a fine grained, dark colored, schistose material. Porosity values ranged from 0.40 to 2.85 percent and averaged 1.29 percent. Fourteen-day absorption values (ratio of the weight of water absorbed to the weight of specimen) averaged 0.24 percent. Expressed on the volume basis for direct comparison with porosity values the average absorption is 0.64 percent which indicates that the pores of granite are normally less than half filled with water when soaked for 14 days. Several absorption determinations made with specimens soaked for 1 year showed only slight increases over the values obtained for 14 days' soaking. The saturation coefficient (ratio of volume absorption to total pore space) is sometimes used as an indication of frost resistance in which it is assumed that masonry materials giving a coefficient of less than 0.9 have satisfactory resistance to frost action. Judged on this basis the granites of this country may be assumed to be little affected by frost as a weathering agent.

MEETING OF ADVISORY COMMITTEE ON ENAMELS

On December 1, 1934, the Advisory Committee on Enamels met at the Bureau to discuss a new investigation on enamels which has been planned by the Bureau. The plans were formulated after correspondence with a number of prominent technologists on the question, "What type of investigation is most needed by the industry?" Of these correspondents, 10 consented to serve on the advisory committee, namely: A. I. Andrews, R. D. Cooke, R. R. Danielson, J. E. Hansen, R. M. King, W. H. Pfeiffer, E. P. Poste, R. B. Schaal, B. T. Sweely, H. G. Wolfram.

Although several members could not be present, the meeting was eminently successful. Members representing manufacturers offered to assist in the work by making frits of 9 different compositions which had been selected as representative of the types used in commercial practice. These are to be presented to the Bureau for use in the first phase of the study. In this phase important physical and chemical properties of these enamels will be determined, beginning with viscosity (or plastic deformation) and surface tension. Other properties which have been listed for study include: strength, elasticity, thermal expansion, and strains set up in applied coatings of the enamels; refractoriness, abrasion resistance, reflectance and gloss; resistance to acid, alkali, water, and steam; and structure as indicated by microscopic and X-ray examination. Ultimately the plan calls for a study of the effects upon these properties of variations in single constituents, such as fluorine, boric oxide, lead oxide, phosphate radical, aluminum oxide, etc.

The Bureau has been requested, and has agreed, to undertake the development of standard test methods for enamels and enameled products. This request was made by the technical

research section of the Porcelain Enamel Institute, following a meeting in Columbus, Ohio, on September 5. A number of the outstanding enamel laboratories have offered to cooperate by trying out the methods which the Bureau may develop, to determine the reproducibility of results, and afford opportunity for any modifications before they are proposed as permanent standards. The cooperating enamel laboratories include those of the following organizations: American Rolling Mill Co., Chicago Vitreous Enamel Product Co., Ferro Enamel Corporation, Mellon Institute of Industrial Research, Metal and Thermit Corporation, Ohio State University, Porcelain Enamel and Manufacturing Co., Titanium Alloy Manufacturing Co., and the University of Illinois. It is planned that tests for reflectance, abrasion resistance, and acid resistance will receive first consideration.

The Bureau wishes to express sincere appreciation of the wholehearted manner in which representatives of the enamel industry are cooperating in these undertakings, and also the hope that the practical application of the findings will be of substantial value to the industry.

NEW AND REVISED PUBLICATIONS ISSUED DURING DECEMBER 1934

Journal of Research[1]

Journal of Research of the National Bureau of Standards, vol. 13, no. 6, December 1934 (RP nos. 743 to 752, inclusive). Price 25 cents. Obtainable by subscription.

Research Papers[1]

[Reprints from the August, September, and October 1934 Journal of Research]

RP702. A brightness meter for luminous preparations. L. F. Curtiss. Price 5 cents.

RP709. Opacity standards. Deane B. Judd. Price 5 cents.

RP711. Properties of knit-underwear fabrics of various constructions. C. H. Hamlin and R. K. Worner. Price 5 cents.

RP712. Protective value of nickel and chromium plating on steel. W. Blum, P. W. C. Strausser, and A. Brenner. Price 5 cents.

RP715. Critical study of the determination of ethane by explosion with oxygen or air. J. R. Branham and M. Shepherd. Price 5 cents.

RP719. Ether-insoluble or gel rubber hydrocarbon, its solution, crystallization, and properties. W. H. Smith and C. P. Saylor. Price 5 cents.

RP720. Vulcanization and stress-strain behavior of sol, gel, and total rubber hydrocarbon. W. H. Smith and W. L. Holt. Price, 5 cents.

RP726. Properties of gray cast iron as affected by casting conditions. C. M. Saeger, Jr., and E. J. Ash. Price, 5 cents.

RP727. Effect of melting conditions on the running quality of aluminum cast in sand molds. A. I. Krynitsky and C. M. Saeger, Jr. Price, 5 cents.

RP728. Critical solution temperatures of some hydrocarbons in sulphur dioxide. R. T. Leslie. Price, 5 cents.

Technical News Bulletin[1]

Technical News Bulletin 212, December 1934, with index. Price, 5 cents. Obtainable by subscription.

LETTER CIRCULARS

It is the intent of the Bureau to distribute single copies of these Letter Circulars on request only to those parties having special interest in the individual Letter Circular. Economy necessitates limitation in the number of copies issued. It is not the intent to supply parties with a copy of each Letter Circular issued during the month. Letter Circulars are necessarily of a temporary nature designed to answer numerous inquiries on a given subject. Requests should be addressed to the National Bureau of Standards.

LC429. Information on ultra-violet transparency of window materials and fabrics.

LC430. Magnetic insulators.

LC431. Railway track scale testing service of the National Bureau of Standards, fiscal year July 1, 1933, to June 30, 1934.

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LC432. Publications relating to building codes and construction practice, home building, and maintenance—home ownership.

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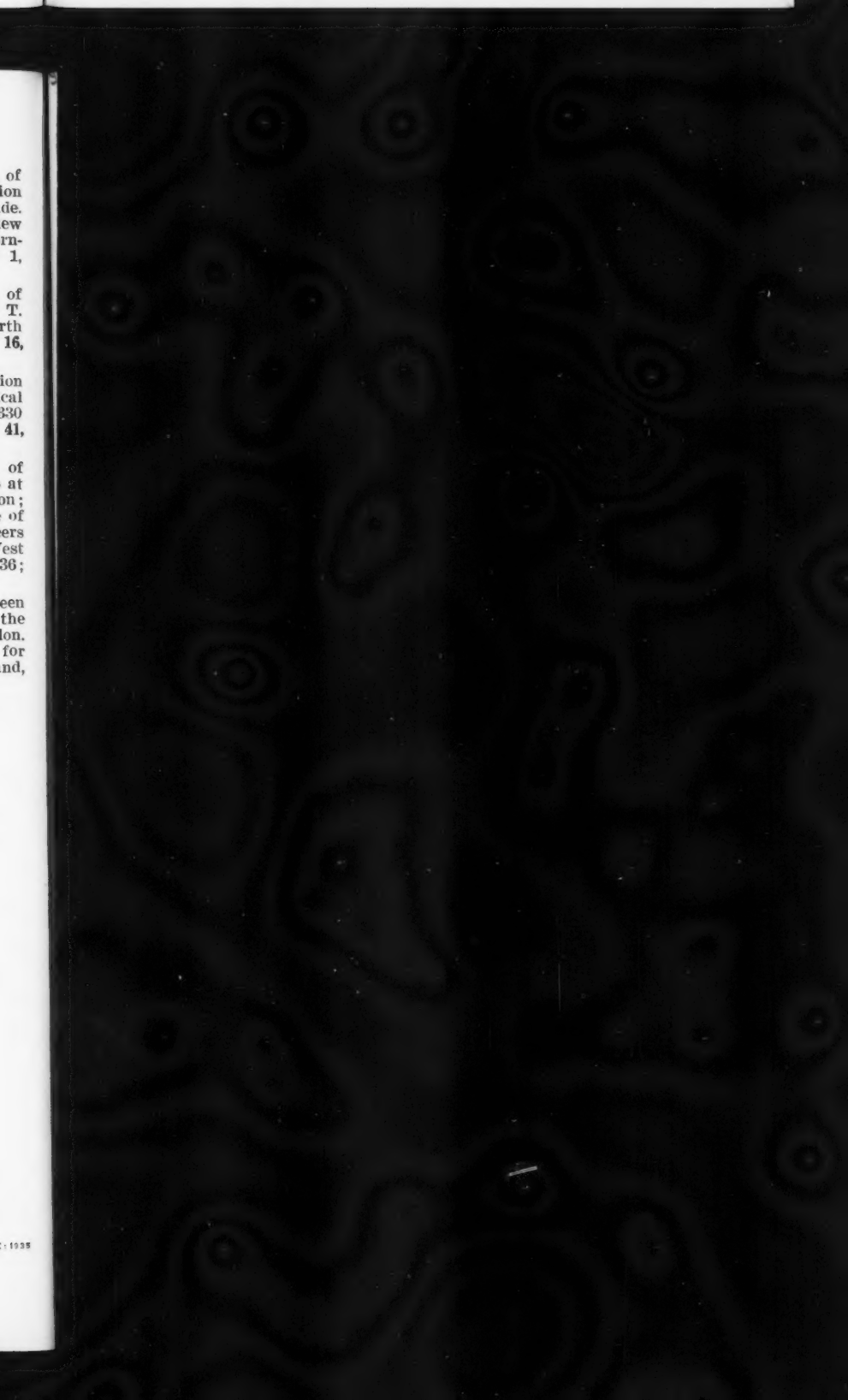
[2] These publications are not obtainable from the Government. Requests should be sent direct to publishers.

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